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ABSTRACT

The reading comprehension items for the Nelson Reading Skills Test, a revision of a widely used standardized reading test, were administered to several hundred fourth- and sixth-grade students in order to determine whether the student's ability to answer correctly actually depended on his comprehension of the accompanying passage. All the field-tested items were divided into nine booklets, which contained one normal reading comprehension subtest and one subtest with only the questions. An index of passage dependency was computed for each item, and the index was used to help the authors locate items that were weak. The index also indicated the effect of passage dependency on skill categories. (Author/BW)

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PASSAGE-DEPENDENCY DATA IN THE SELECTION OF READING COMPREHENSION TEST ITEMS

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PASSAGE-DEPENDENCY DATA IN THE SELECTION OF READING COMPREHENSION TEST ITEMS

Most standardized reading comprehension tests have several sets of one or more multiple-choice questions which follow a sentence, paragraph, or passage of reading material. Supposedly, the number of questions answered correctly is a measure of how well the student understands the reading material. However, the research evidence indicates that this is not always the case.

Various writers have noted that unless the passages and items are carefully written, it may be possible for students to answer the questions correctly without reading the passages (Weaver, Bickley, and Ford, 1969; Pyrczak, 1974; Pyrczak, 1975; and Tuinman, 1974). In these studies students were able to score considerably above chance levels on various reading tests without reading the passages. Apparently, the students determine correct responses by obtaining cues from other questions in the set, by eliminating faulty and irrelevant distractors, and from general knowledge about the topic.

Tuinman (1970) administered the first 40 items of the Sequential Test of Educational Progress-Reading, Form 3A, to 134 seventh, eighth, and ninth graders in two conditions--reading passages and without reading passages. The mean score for the without passages test was 34 per cent of the possible score, and it was 68 per cent with passages.

Farr and Smith (1970) removed the paragraphs from the Nelson-Denny comprehension test and administered it to a group of college sophomores; then, three weeks later re-administered it to them with the paragraphs included. They found that for 5 of the 32 items, the number of correct responses under the passage-out

condition exceeded the number of correct responses under the passage-in condition. Also, for 12 of the items, the number of correct responses in the passage-out condition exceeded 50 per cent.

Tuinman (1974) studied the passage dependency of five major reading tests. Using a sample of 9,451 fourth, fifth, and sixth grade students, he found that the students' performance without passages was considerably above chance score levels. In fact, when students were not allowed to read the passages, their performance loss was less than 30 per cent of their passage-in performance. This study also showed that on these tests passage dependency is a more serious problem in grade 4 than in grades 5 and 6.

Tuinman (1974) points out that finding low passage dependency in a study in which the items are administered without the reading passages may not necessarily invalidate the test. In normal testing situations the same conditions as a research study would not result unless the student simply skipped the reading material and tried to answer the questions. However, if the reading material is skipped, the test is not valid as a reading measure. Therefore, a research study showing low passage dependency signals a potential of invalidity more than actual lack of validity.

Both Tuinman (1974) and Pyrczak (1974, 1975) indicate that teachers, school administrators, and test publishers should give more attention to the passage dependency situation of reading comprehension tests. Pyrczak (1974) suggested:

> . . . in future test-development projects, reading-comprehension items routinely be administered in the absence of the associated passages to determine their passage-dependence. Such a procedure should contribute to the measurement of true-score variance associated with reading-comprehension abilities and thus to the enhancement of the validity of a test of reading comprehension. (p. 347)

Pyrczak's suggestion seems very appropriate. As previously indicated, low passage-dependency may not invalidate a test, but increasing the passage dependency seems likely to improve it as a measure of reading comprehension. It seems logical that the more cues, faulty distractors, and general knowledge questions that can be eliminated, the more likely the scores will indicate true reading ability. Passage-dependency tryouts of items should help reveal problems with the items.

This Study

The co-author of this paper and Houghton Mifflin Company have developed a new reading test, the Nelson Reading Skills Test (NRST), which is designed for grades 3 through 9. During the NRST's development a passage-dependency study of the reading comprehension subtest items was completed. That study, its results and implications will be discussed in the remainder of this paper.

The passage-dependency tests were administered in October, 1975. The sample consisted of approximately 1600 Grade four and Grade six students from five widely separated school districts. On an index of socio-economic status (SES) which was composed from information about family income and education for all school districts in the United States, the weighted average of SES's for these five districts was slightly below the mid-point. A few of the answer sheets were unscorable so the analysis was completed on 761 and 813 answer sheets from Grades 4 and 6, respectively.

A total of 327 items was used in the passage-dependency study. The items were divided among nine test booklets. The first subtest of each booklet contained a normal reading comprehension test with reading passage and questions about the passage; the second subtest contained approximately an equal number of questions but without reading passages. The large number of items and booklets made it possible to arrange each booklet so that the

questions in the passage-out subtest were not related to any passages in the regular reading comprehension subtest.

Every question appeared twice: once, with its reading passage and once in another booklet, without its reading passage. In the passage-out subtest, sets of questions about a single passage were kept together as a unit.

The administration of test booklets by grades was as follows:

Grade	Booklets	Total Items
4	1,2,3,4,5,6	218
6	3,4,5,6,7,8,9	253

The 74 items in booklets 1 and 2 were deemed to be too easy for Grade 6 and the 109 items in booklets 7, 8 and 9 were deemed too difficult for Grade 4. The 144 items in booklets 3, 4, 5 and 6 had been developed for students in the entire middle grade range; thus, they were administered to students in both grades.

The directions for passage-out subtest, which the teacher read aloud to the students as they silently read them, explained that the students were taking a special test. These directions indicated that students would normally read some material and answer questions about what they had read, but this test was trying to determine how many questions the students might be able to answer without reading the material. They were instructed to read each question carefully because they might be able to find a hint about the correct answer in the question. Appendix A contains a reproduction of the instruction page.

Each subtest had a 25-minute time limit. In earlier tryouts and in this study, over 95% of the students finished the test. Each student took one test booklet. The booklets were handed out in a rotated order in each classroom. All items were multiple choice with four options.

The number of answer sheets analyzed for each test booklet and grade is shown in Table I.

Table I

NUMBER OF STUDENTS TAKING EACH TEST BOOKLET

Test Booklet	Grade 4	Grade 6
1	125	
2	126	
3	135	128
4	131	124
5	125	121
6	119	120
7		111
8		109
9		110

The numbers of items tried out in each grade of this study are shown in Table II. Two kinds of items were tried out in the study, reading comprehension and words in context; they were analyzed separately.

Table II

NUMBER OF ITEMS PER GRADE

	Grade 4	Grade 6
Reading Comprehension	176	192
Words in Context	42	61
Total	218	253

Results

The item data from the tryout were analyzed by comparing three statistics. First, the percentage of students selecting the correct answer with the passage-in (PI). Second, the percentage of students selecting the correct answer with the passage-out (PO). Third, these percentages were used to compute a passage-dependency index (PDI) as suggested by Tuinman (1974):

$$PDI = 1 - d_{PO}/d_{PI}$$

Where:

d_{PO} = the proportion of correct responses to item i under the passage-out (PO) condition.

d_{PI} = the proportion of correct responses to item i under the passage-in (PI) condition.

Note: Tuinman's formula used NP to represent the passage-out condition and P to represent the passage-in condition. We believe PO and PI is less confusing.

The median values for each statistic for all the items in the study are shown in Table III. The range of each statistic is shown in Table IV.

Table III

MEDIAN VALUES FOR PASSAGE-DEPENDENCY STUDY ITEMS

Reading Comprehension

	Grade 4 (176 Items)	Grade 6 (196 Items)
PO	.33	.35
PI	.60	.65
PDI	.35	.42

Words in Context

	Grade 4 (42 Items)	Grade 6 (6[illegible] Items)
PO	.32	.41
PI	.48	.63
PDI	.32	.30

Table IV

RANGE OF EACH STATISTIC FOR PASSAGE-DEPENDENCY STUDY ITEMS

Reading Comprehension

	Grade 4 (176 Items)	Grade 6 (196 Items)
PO	.06 - .80	.10 - .78
PI	.17 - .95	.17 - .97
PDI	-.41 - .93	-.88 - .87**

Words in Context

	Grade 4 (42 Items)	Grade 6 (61 Items)
PO	.13 - .70	.13 - .87
PI	.13 - .72	.16 - .88
PDI	-.36 - .75	-.38 - .76

** One item in this group had a PO that was more than double its PI.

Discussion

Generally, the results of the passage-dependency study supported the validity of the NRST items. While the PO medians were not as low as chance score (.25) they were, except for the Words in Context items in Grade six, relatively close. More importantly, however, the passage-dependency results helped in the selection and/or changing of items in ways believed to be beneficial in constructing a test with greater validity.

For example, one eight-item selection about skyscrapers, which might have been included in the NRST, was clearly shown as very weak by the PDI data. The normal kind of item data (i.e. percentage correct and discrimination analysis index) would have shown that the items were difficult, but fairly good discriminators. However, the median PDI value for the items was negative; therefore, it seemed that the items were not only difficult, but they were also confusing to the students.

Another set of eight-items that was from a selection about sound patterns was administered to both grades in the study. The items' median values were .28, .28 and -.09 for PO, PI and PDI, respectively, for Grade four, but were .34, .65 and .38 for Grade six. The items also met other selection criteria and are included in the level of the test which is appropriate for Grade six students. The items from a selection about bullfighters also had a negative PDI in Grade four, but it was an acceptable selection for the upper levels. Several other selections had similar data but less pronounced differences.

The data were useful in looking at individual items, too. Several items that had low PDI's were slightly altered before being used in the NRST. Also, in some selections, items which had low PDI's were dropped.

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READING COMPREHENSION - Special Test

Directions. This test is like the one you just finished, except the reading passages have been removed. All of the questions are about reading passages, but you will not get to read the passages. This is being done in order to determine how many questions you know without doing the reading. You will be able to figure out the answer for many of the questions, but on some of them you will simply have to guess.

Please read each question and pick the one best answer for it. On your answer sheet, find the row of answer ovals that has the same number as the question. Fill in the oval that has the same letter as the answer you choose.

Look at the two sample questions below.

51. Final means
A. first
B. last
C. long
D. backward

On this question you will probably know the answer without having a reading passage. The word that most nearly means 'Final' is 'B. last.' On your answer sheet, fill in the 'B' oval for question 51.

52. This passage is mostly about
A. fishing
B. trains
C. people
D. the moon

On this question you will probably have to make a guess. Mark the answer you choose in the ovals for question 52.

Read each question carefully because there may be a hint in it about the correct answer. Try to answer every question. If you are not certain about the answer to a question, pick the answer that seems best and move quickly on to the next question.

When you do finish the questions on a page, turn to the next page and do as many pages as you can before you are told to stop. If you finish before your teacher tells the class to stop, remain quietly in your place. Do not turn back to the first test that you took.

Are there any questions?

You will have 25 minutes to work on this test. I will tell you when time is up. When you begin this test, the first question you will answer will be numbered 53. Remember to mark your answer to this question on your answer sheet in the ovals after number 53.

Now, turn to the next page and begin to answer the questions.